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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/830,182

04/22/2004

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426.008A

7722

47888 7590 09/09/2008  
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EXAMINER

HAILEY, PATRICIA L

ART UNIT

PAPER NUMBER

1793

MAIL DATE

DELIVERY MODE

09/09/2008

PAPER

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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Application Number: 10/830,182  
Filing Date: April 22, 2004  
Appellant(s): GULLA ET AL.

\_\_\_\_\_  
Charles A. Muserlian  
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed May 22 and June 13, 2008, appealing from the Office action mailed December 20, 2007.

**(1) Real Party in Interest**

A statement identifying by name the real party in interest is contained in the brief.

**(2) Related Appeals and Interferences**

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**(3) Status of Claims**

The statement of the status of claims contained in the brief is correct.

**(4) Status of Amendments After Final**

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

**(5) Summary of Claimed Subject Matter**

The summary of claimed subject matter contained in the brief is correct.

**(6) Grounds of Rejection to be Reviewed on Appeal**

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

**(7) Claims Appendix**

The copy of the appealed claims contained in the Appendix to the brief is correct.

**(8) Evidence Relied Upon**

5,051,389	LANG ET AL.	9-1991
5,166,362	FORQUY ET AL.	11-1992
3,840,389	KOBYLINSKI ET AL.	10-1974
6,649,300	ITO ET AL.	11-2003

Reeve, R. W. et al., "Methanol Tolerant Oxygen Reduction Catalysts Based on Transition Metal Sulfides," Department of Chemistry, The University of Newcastle upon Tyne, United Kingdom NE1 7RU.

**(9) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

*Claim Rejections - 35 USC § 103*

*Claims 1, 3, 5-7, 10, 12, 13, 15-19, and 46-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Forquy et al. (U. S. Patent No. 5,166,362) in view of Lang et al. (U. S. Patent No. 5,051,389) and Ito et al. (U. S. Patent No. 6,649,300).*

Forquy et al. disclose a catalyst comprising ruthenium sulphide in either bulk or supported form, as well as a mixture of sulphides of ruthenium and at least one other transition metal selected from the group consisting of, inter alia, cobalt, wherein the proportion of metal other than ruthenium in the mixture is “up to 80 by weight”. See col. 2, lines 22-38 of Forquy et al., which, at lines 27-30, also discloses active carbon as an exemplary support.

For the preparation of supported catalysts, the support is impregnated with one or more metal salts (for example, chlorides), followed by direct sulphurization with a mixture of hydrogen and H<sub>2</sub>S (2 to 50% by volume, preferably approximately 15%), or with H<sub>2</sub>S diluted in an inert gas (for example, nitrogen) at a temperature between 300°C and 700°C. These temperature treatments are preferably carried out in the reactor. See col. 2, lines 52-66 of Forquy et al. (considered to read upon **claims 5, 12, 13, 16, 17, and 47**).

Example 2 of Forquy et al. depicts drying of an exemplary catalyst precursor at temperature between 100°C and 200°C, followed by sulphurization at 400°C for 4 hours. See col. 4, lines 35-39 of Forquy et al. (considered to read upon **claims 15, 18, 19, and 48**).

Because this reference discloses a mixed sulfide supported on carbon, as recited in the instant claims, the catalyst of Forquy et al. would be expected by one of ordinary skill in the art to function as an “electrocatalyst for oxygen reduction”, absent the showing of convincing evidence to the contrary.

Forquy et al. do not explicitly disclose “carbon black” as the support, nor does this reference disclose a surface area for said support.

Lang et al. disclose catalysts prepared by depositing a metal or metal compound onto a preformed carbon support and thereafter converting the metal or metal compound to an oxide or sulfide. Exemplary metals include cobalt and ruthenium; suitable carbons include carbon black. See col. 3, lines 3-19 and col. 4, lines 19 and 20 of Lang et al.

Because Forquy et al. and Lang et al. disclose catalyst compositions having similar components, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Forquy et al. by substituting carbon black for active carbon, as both carbon black and active carbon are known catalyst supports.

Ito et al. at col. 3, lines 49-65 disclose that conductive carbons (e.g., furnace and acetylene blacks – considered equivalent to “carbon black”) can exhibit a BET surface area of 240 m<sup>2</sup>/g.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Forquy et al. by employing conductive carbons such as that disclosed by Ito et al., which teaches known surface areas of carbon black.

With respect to **claims 6 and 12**, which, in their present form, are product-by-process claims (“obtained by...”), it has been held that... “[A]ny difference imparted by the product by process limitations would have been obvious to one having ordinary skill in the art at the time the invention was made because where the examiner has found a substantially similar product as in the applied prior art the burden of proof is shifted to the applicant to establish that their product is patentably distinct, not the examiner to show that the same is a process of making.” In re Brown, 173 U.S.P.Q. 685 and In re Fessmann, 180 U.S.P.Q. 324.

*Claims 20-22 and 36-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over “Methanol Tolerant Oxygen Reduction Catalysts Based on Transition Metal Sulfides”, by R. W. Reeve et al., in view of Forquy et al. (U. S. Patent No. 5,166,362), Lang et al. (U. S. Patent No. 5,051,389), and Ito et al. (U. S. Patent No. 6,649,300).*

The Reeve et al. article discloses carbon-supported transition metal sulfide electrocatalysts such as  $\text{Mo}_x\text{Ru}_y\text{S}_z$ . See page 3463 of the article, under the heading "Experimental".

The article also discloses gas diffusion electrodes prepared by applying catalyzed carbons to Teflonized carbon paper substrates using Nafion (**claims 20-22 and 36-40**). See page 3464 of the Reeve et al. article, the paragraph entitled "Electrode manufacture".

Forquy et al., Lang et al., and Ito et al. are relied upon for their teachings as stated in the above 103(a) rejection. Although these references teach catalysts reading upon Applicants' electrocatalyst as recited in claims 1, 5-7, 10, 12, 13, 15-19, and 46-48, these references do not teach or suggest the limitations of claims 20-22 and 36-40.

However, Forquy et al. disclose, in addition to cobalt, molybdenum as an exemplary transition metal suitable for constituting Patentees' "mixture of sulphides of ruthenium and at least one other transition metal" (col. 2, lines 31-38).

Therefore, because these were art-recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute cobalt for molybdenum, given the equivalence between molybdenum and cobalt in preparing a catalytic mixture of metal sulfides, as set forth in Forquy et al., and thereby obtain Applicants' claimed invention as recited in claims 20-22 and 36-40.



*Claims 1, 3, 5-7, 12, 14-19, 47, and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kobylinski et al. (U. S. Patent No. 3,840,389) in view of Forquy et al. (U. S. Patent No. 5,166,362).*

Kobylinski et al. disclose catalyst prepared by coating a support (such as refractory oxides, or activated carbon, said support exhibiting a surface area from about 10 m<sup>2</sup>/g to about 500 m<sup>2</sup>/g; see paragraph 5) with a metal sulfide selected from the group consisting of (1) the sulfides of ruthenium and/or rhodium and (2) the sulfides of ruthenium and/or rhodium in combination with one or more of the sulfides of platinum, palladium, osmium, or iridium, and the product resulting therefrom. See paragraph 1 of Kobylinski et al. (considered to read upon **claims 5-8**).

The catalysts are prepared by impregnating the support with a solution, aqueous or alcoholic, containing a dissolved salt of the aforementioned metals. Suitable salts include chlorides and nitrates; when an alcoholic solution is employed, any suitable alcohol (e.g., propanol) is satisfactory. Suitable impregnation can be obtained over a period ranging from about 15 minutes to about 6 hours; the temperature of treatment ranges from about 15° to about 95°C. Pressure is not critical (considered to read upon the limitations of **claim 15**) but generally atmospheric pressure will suffice. See paragraph 6 of Kobylinski et al.

The impregnated support is then treated with H<sub>2</sub>S to precipitate the corresponding metal sulfide under conditions similar to those employed for impregnation. The impregnated support may also, if wet with water or alcohol after

treatment with H<sub>2</sub>S, may be dried at temperatures ranging from about 80°C to about 180°C. Drying can be effected in air, an inert atmosphere (such as nitrogen or H<sub>2</sub>S). Further, the catalyst is preferably subjected to calcinations at temperatures ranging from about 400°C to about 600°C; as in the drying step, calcination can be effected in air, an inert gas such as nitrogen, or even H<sub>2</sub>S. See paragraph 8 of Kobylinski et al. (**claims 11, 14, 16-19, 47, and 48**).

Kobylinski et al. do not explicitly disclose that the catalyst is an “electrocatalyst”, or that the support is “conductive”. However, because the reference teaches the same components as recited in Applicants’ claims as the “electrocatalyst” and the “conductive” support, it would have been obvious to one of ordinary skill in the art at the time the invention was made to reasonably expect that the catalysts of Kobylinski et al. would function as an “electrocatalyst”, absent the showing of convincing evidence to the contrary.

It is well settled that when a claimed composition appears to be substantially the same as a composition disclosed in the prior art, the burden is properly upon the applicant to prove by way of tangible evidence that the prior art composition does not necessarily possess characteristics attributed to the CLAIMED composition. In re Spada, 911 F.2d 705, 15 USPQ2d 1655 (Fed. Circ. 1990); In re Fitzgerald, 619 F.2d 67, 205 USPQ 594 (CCPA 1980); In re Swinehart, 439 F.2d 2109, 169 USPQ 226 (CCPA 1971).

Kobylinski et al. also do not disclose a mixed sulfide of ruthenium and cobalt, as instantly claimed.

Forquy et al. disclose a catalyst comprising ruthenium sulphide in either bulk or supported form, as well as a mixture of sulphides of ruthenium and at least one other transition metal selected from the group consisting of, inter alia, cobalt, wherein the proportion of metal other than ruthenium in the mixture is “up to 80 by weight”. See col. 2, lines 22-38 of Forquy et al., which, at lines 27-30, also discloses active carbon as an exemplary support. Note that rhodium and palladium are also disclosed in Kobylinski et al.

For the preparation of supported catalysts, the support is impregnated with one or more metal salts (for example, chlorides), followed by direct sulphurization with a mixture of hydrogen and H<sub>2</sub>S (2 to 50% by volume, preferably approximately 15%), or with H<sub>2</sub>S diluted in an inert gas (for example, nitrogen) at a temperature between 300°C and 700°C.

In view of the similarities between Kobylinski et al. and Forquy et al., it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Kobylinski et al. by substituting cobalt for either rhodium or palladium, as suggested by Forquy et al., as substitution for known equivalents is well within the level of ordinary skill in the art.

#### **(10) Response to Argument**

In response to Appellants’ argument that neither the Examiner nor the Appeal Conference Board “have responded to Applicants’ arguments that the Professor Faita’s

declaration clearly shows that Forquy et al is unrelated to Applicants' invention", the Examiner respectfully submits that said Declaration was submitted on May 18, 2007, subsequent to a Final Rejection, i.e., at a time where consideration of the Declaration was not required. Appellants' filing of a Request for Continued Examination did not necessitate consideration of the Declaration.

In the Final Rejection mailed on December 20, 2007, the Examiner stated:

"In any event, the Declaration merely states that activated carbon and carbon black are different substances. While this is true, they are both known in the art as catalyst supports (as set forth in the rejections of record), and are therefore art-recognized equivalents. Substitution of one for the other is well within the level of ordinary skill in the art."

The Declaration fails to show patentable distinction between the claimed invention and the cited references of record. Further, the Declaration is not even commensurate in scope with the claims under appeal. Appellants have not provided any comparative evidence showing distinction between the claimed invention and the references of record.

The cited references of record are relied upon to teach catalysts comprising cobalt and ruthenium sulfide (or sulphide) on supports such as active carbon and carbon black. The cited references of record are relevant to the claimed invention because they are considered to *structurally* read upon Appellants' claims, as these references disclose catalyst components comparable to those recited in the claims under appeal.

**(11) Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/PATRICIA L. HAILEY/  
Primary Examiner, Art Unit 1793  
August 29, 2008

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